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Effect of Row Spacing, Nitrogen and Phosphorus on Dry Matter Production, Yield and N, P Uptake of Unirrigated Safflower in Vertisol of South Gujarat

Z. G. Patel, S. C. Mehta and N. M. Patel

Department of Agronomy, N. M. College of Agriculture, Gujarat Agricultural University, Navsari–396 450

Safflower is a rich source of vegetable oil and hence the importance of increasing safflower seed yield with better quality by agronomic methods, needs no emphasis. Since this crop is mainly grown as a mixed crop, sufficient information is not available with regards to its agronomic aspects when grown as a sole crop. For this purpose, an experiment was conducted to study the effect of row spacing and levels of N, P fertilizers on the yield and quality of safflower variety 'Bhima' on vertisol of college farm, Gujarat Agricultural University, Navsari Campus in the *rabi* season of 1988-89. The soil of the experimental plot was clayey in texture, low in nitrogen, medium in phosphorus and high in available potash, having pH 8.0. Twenty seven treatment combinations consisting of three levels, each of spacing (30, 45, 60 cm), nitrogen (0, 25, 50 kg N/ha) and phosphorus (0, 25, 50 kg P_2O_5/ha), were tried in factorial randomised block design with three replications.

Effect of spacing

The results in Table 1 indicated that the dry matter production was continuously increased upto harvest with all the spacings. Significantly higher dry matter production per plant was recorded with closer spacing than 60 cm in initial stages, but at the later stages, wider spacings (45 and 60 cm) recorded significantly higher dry matter yield than closer spacing of 30 cm, might be due to better development of crop and crop canopy. Similar observations were recorded by Ahuja *et al.* (1981).

The seed yield of safflower was significantly influenced by spacing and the maximum seed yield of 11.81 q/ha was recorded with narrow spacing of 30 cm due to higher plant population (Table 2). The respective increase in seed yield by 30 cm spacing was of the order of 4.48 and 15.80 per cent over 45 and 60 cm row spacing. Similarly the straw yield of safflower was significantly influenced by spacing and the highest yield was recorded with narrow spacing of 30 cm, followed by 45 and 60 cm. Similar results were obtained by Bhan *et al.* (1980) and Chauhan *et al.* (1979). Looking to the data in Table 2 on uptake of nitrogen and phosphorus in safflower seeds, the highest uptake of both these nutrients were also recorded with narrow spacing of 30 cm. This

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has also helped in boosting up the seed and straw yield of safflower in closer spacing.

Effect of nitrogen

The dry matter production in safflower recorded at various crop growth stages showed an increasing trend with an increase in the rate of nitrogen application (Table 1). At harvest, the increase in dry matter production with application of 25 and 50 kg N/ha to a safflower crop was 25.10 and 36.90 per cent higher over control, respectively. The increase in dry matter yield by nitrogen application might be due to

TABLE 1

Periodical dry matter production per plant (g) of safflower as affected by spacing and fertilizer treatments.

Treatment	Dry matter production/plant (g)			
	30 DAS	60 DAS	90 DAS	At harvest
Spacing (cm)				
30	1.50	10.30	34.02	37.19
45	1.58	11.15	37.30	39.66
60	1.73	12.97	37.85	40.38
S. Em. ±	0.03	0.36	0.71	0.65
C. D. at 5%	0.10	1.02	2.03	1.86
Nitrogen (kg N/ha)				
0	1.30	7.93	29.48	32.33
25	1.64	12.08	37.88	40.64
50	1.87	14.41	41.81	44.26
S. Em. ±	0.03	0.36	0.71	0.65
C. D. at 5%	0.10	1.03	2.03	1.86
Phosphorus (kg P_2O_5/ha)				
0	1.43	10.90	34.81	37.50
25	1.66	11.58	37.28	39.61
50	1.72	11.94	37.07	40.12
S. Em. ±	0.03	0.36	0.71	0.65
C. D at 5%	0.10	NS	2.03	1.86

DAS = Days After Sowing.

better assimilation of nitrogen by the crop which enhanced the growth and development of the crop.

Significantly the highest seed yield of safflower was obtained with the application of 50 kg N/ha, which was 20.53 and 55.05 per cent more than 25 kg N/ha and control, respectively (Table 2). Outrightly the highest straw yield was recorded with the application of 50 kg N/ha, followed by 25 kg N/ha and the control. The respective increase in yield due to 50 and 25 kg N/ha was 26.75 and 48.92 per cent than the control. This might be due to higher nutrient uptake by the crop with nitrogen application and low N status of the soil. These results are in confirmity to those of Pisal and Shinde (1987).

Effect of phosphorus

The dry matter yield of safflower recorded at different crop growth periods was significantly increased with application of phosphorus. But the rate of phosphorus

TABLE 2

Seed and straw yield (q/ha) and nitrogen and phosphorus uptake by safflower (kg/ha) as influenced by treatments.

Treatment	*Seed yield (q/ha)*	*Straw yield (q/ha)*	*'N' uptake (kg/ha)*	*P_2O_5 uptake (kg/ha)*
Spacing (cm)				
30	11.81	37.86	38.93	10.38
45	11.31	35.30	37.99	9.65
60	10.20	30.14	32.88	8.88
S. Em. ±	0.109	0.427	0.773	0.253
C. D. at 5%	0.311	1.211	2.195	0.718
Nitrogen (kg M/ha)				
0	8.69	27.50	22.99	7.02
25	11.17	34.85	37.45	10.16
50	13.47	40.95	49.36	12.17
S. Em. ±	0.109	0.427	0.773	0.253
C. D. at 5%	0.311	1.211	2.195	0.718
Phosphorus (kg P_2O_5/ha)				
0	10.42	32.94	34.96	7.60
25	11.49	35.40	38.56	10.94
50	11.41	34.95	36.28	10.37
S. Em. ±	0.109	0.427	0.773	0.253
C. D. at 5%	0.311	1.211	2.195	0.718

application did not influence the dry matter accumulation in safflower (Table 1). This might be due to marginal effect of higher rate of phosphorus on growth. Sinha *et al.* (1985) also recorded similar observations.

The seed yield of safflower was significantly influenced by application of phosphorus upto 25 kg P_2O_5/ha, which was 10.28 and 0.71 per cent higher than control and 50 kg P_2O_5/ha. The uptake of nitrogen and phosphorus was also significantly improved by the application of 25 kg P_2O_5/ha (Table 2). This also reflected in to efficient utilization of nutrients and ultimately increased the seed yield of safflower. The phosphorus application also affected the straw yield of safflower significantly. The maximum yield (35.40 q/ha) was recorded with 25 kg P_2O_5/ha and found to be statistically at par with 50 kg P_2O_5/ha. These results are in accordance with the findings of Singh *et al.* (1983).

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